



A subsidiary of Pinnacle West Capital Corporation

10 CFR 50.73

Palo Verde Nuclear  
Generating Station

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102-06334-DCM/JR  
March 21, 2011

ATTN: Document Control Desk  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

Dear Sirs:

**Subject: Palo Verde Nuclear Generating Station (PVNGS) Unit 3  
Docket No. STN 50-530  
License No. NPF-74  
Licensee Event Report 2011-001-00**

Enclosed please find Licensee Event Report (LER) 50-530/2011-001-00 that has been prepared and submitted pursuant to 10 CFR 50.73. This LER reports an automatic actuation of the reactor protection system (reactor trip) and auxiliary feedwater actuation signal subsequent to a failed open main feedwater pump minimum flow recirculation valve.

In accordance with 10 CFR 50.4, copies of this LER are being forwarded to the Nuclear Regulatory Commission (NRC) Regional Office, NRC Region IV and the Senior Resident Inspector. If you have questions regarding this submittal, please contact Marianne Webb, Section Leader, Regulatory Affairs, at (623) 393-5730.

Arizona Public Service Company makes no commitments in this letter.

Sincerely,

DCM/TNW/MNW/JR/gat

Enclosure

cc:	E. E. Collins Jr.	NRC Region IV Regional Administrator
	L. K. Gibson	NRC NRR Project Manager for PVNGS (electronic / paper)
	J. R. Hall	NRC NRR Senior Project Manager (electronic / paper)
	M. A. Brown	NRC Senior Resident Inspector for PVNGS

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**LICENSEE EVENT REPORT (LER)**(See reverse for required number of  
digits/characters for each block)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA/Privacy Section (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to [infocollects.resource@nrc.gov](mailto:infocollects.resource@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

<b>1. FACILITY NAME</b> Palo Verde Nuclear Generating Station (PVNGS) Unit 3	<b>2. DOCKET NUMBER</b> 05000530	<b>3. PAGE</b> 1 OF 4
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**4. TITLE**  
Unit 3 Reactor Trip Due to Failed Open Main Feedwater Pump A Minimum Flow Recirculation Valve

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
01	19	2011	2011	- 001 -	00	03	21	2011	FACILITY NAME	DOCKET NUMBER

<b>9. OPERATING MODE</b>  1	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: (Check all that apply)</b>			
	<input type="checkbox"/> 20.2201(b) <input type="checkbox"/> 20.2201(d) <input type="checkbox"/> 20.2203(a)(1) <input type="checkbox"/> 20.2203(a)(2)(i) <input type="checkbox"/> 20.2203(a)(2)(ii) <input type="checkbox"/> 20.2203(a)(2)(iii) <input type="checkbox"/> 20.2203(a)(2)(iv) <input type="checkbox"/> 20.2203(a)(2)(v) <input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 20.2203(a)(3)(i) <input type="checkbox"/> 20.2203(a)(3)(ii) <input type="checkbox"/> 20.2203(a)(4) <input type="checkbox"/> 50.36(c)(1)(i)(A) <input type="checkbox"/> 50.36(c)(1)(ii)(A) <input type="checkbox"/> 50.36(c)(2) <input type="checkbox"/> 50.46(a)(3)(ii) <input type="checkbox"/> 50.73(a)(2)(i)(A) <input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(i)(C) <input type="checkbox"/> 50.73(a)(2)(ii)(A) <input type="checkbox"/> 50.73(a)(2)(ii)(B) <input type="checkbox"/> 50.73(a)(2)(iii) <input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A) <input type="checkbox"/> 50.73(a)(2)(v)(A) <input type="checkbox"/> 50.73(a)(2)(v)(B) <input type="checkbox"/> 50.73(a)(2)(v)(C) <input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 50.73(a)(2)(vii) <input type="checkbox"/> 50.73(a)(2)(viii)(A) <input type="checkbox"/> 50.73(a)(2)(viii)(B) <input type="checkbox"/> 50.73(a)(2)(ix)(A) <input type="checkbox"/> 50.73(a)(2)(x) <input type="checkbox"/> 73.71(a)(4) <input type="checkbox"/> 73.71(a)(5) <input type="checkbox"/> OTHER Specify in Abstract below or in NRC Form 366A
<b>10. POWER LEVEL</b>  100				

**12. LICENSEE CONTACT FOR THIS LER**

<b>FACILITY NAME</b> Marianne Webb, Section Leader, Regulatory Affairs	<b>TELEPHONE NUMBER (Include Area Code)</b> 623-393-5730
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**13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT**

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
E	SJ	VALVE	L121	Y					

**14. SUPPLEMENTAL REPORT EXPECTED**☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE)☒ NO**15. EXPECTED SUBMISSION DATE**

MONTH	DAY	YEAR

**ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)**

On January 19, 2011, at approximately 1840 Mountain Standard Time, Unit 3 was at 100 percent power at normal operating temperature and normal operating pressure when the main feedwater pump A minimum flow recirculation valve (mini-flow valve) failed open causing a percentage of feedwater flow to be diverted to the condenser. Subsequently, Unit 3 experienced a reactor power cutback when main feedwater pump B tripped on low suction pressure. The combination of the main feedwater pump B trip and the main feedwater pump A mini-flow valve failure caused both steam generator water levels to lower causing an automatic reactor trip. Both steam generator levels continued to drop which initiated an auxiliary feedwater actuation signal. The plant was stabilized in Mode 3.

The failed open mini-flow valve was caused by a failed diaphragm in a pneumatic 3-way precision relay within the mini-flow valve control loop. The relay was replaced and Unit 3 was returned to 100 percent power on January 23, 2011, at approximately 0100.

No similar conditions have been reported by Palo Verde in the past three years.

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NARRATIVE

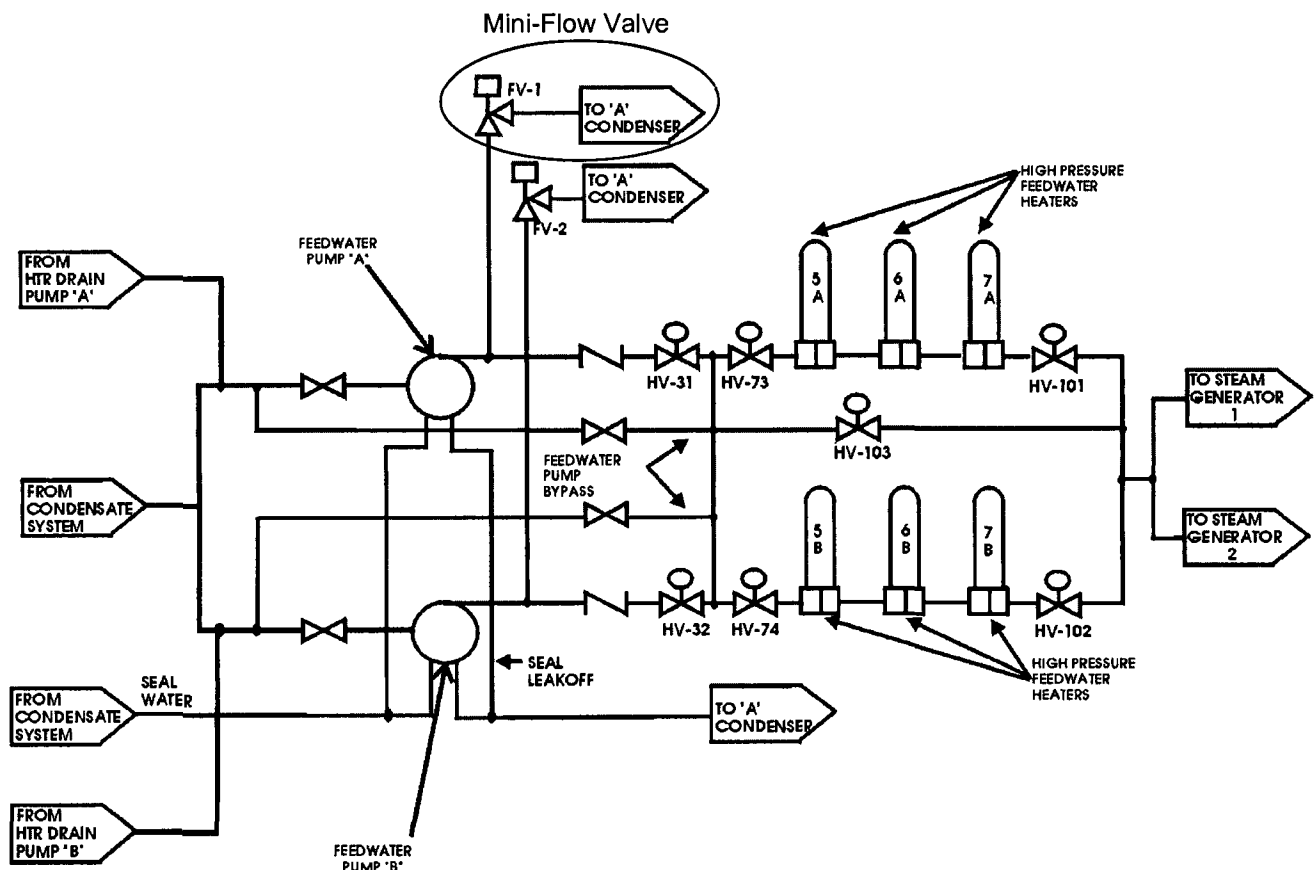
All times are Mountain Standard Time and approximate unless otherwise indicated.

1. REPORTING REQUIREMENT(S):

This Licensee Event Report (LER) is being submitted pursuant to 10 CFR 50.73 (a)(2)(iv)(A) to report an automatic actuation of the reactor protection system (RPS) and an auxiliary feedwater actuation signal (AFAS) associated with a failed open main feedwater pump (MFWP) minimum flow recirculation valve (mini-flow valve). This event was reported to the NRC on January 19, 2011, via the emergency notification system (ENS 46556).

2. DESCRIPTION OF STRUCTURE(S), SYSTEM(S) AND COMPONENT(S):

The main feedwater system (see diagram) (EIIIS Code: SJ) consists of piping, main feedwater pumps (MFWP) (EIIIS Code: JK), high pressure heaters, valves, controls, instrumentation, and associated equipment which supply feedwater to the steam generators (SG) (EIIIS Code: AB).



Feedwater Simplified Diagram

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**NARRATIVE**

Each MFWP is a turbine-driven pump capable of supplying 65 percent of main feedwater system capacity. There are two MFWPs which serve both SGs. The MFWP mini-flow valves assure there is always adequate flow through the MFWPs to prevent pump damage.

Each mini-flow valve has the capability of providing a flow of approximately 7000 gpm to the main condenser (EIS Code: SG). The mini-flow valve is designed to fail open on loss of electrical signal or loss of instrument air to ensure that minimum flow is maintained through the MFWP to prevent pump damage on a loss of downstream flowpath during pump operation.

**3. INITIAL PLANT CONDITIONS:**

On January 19, 2011, Palo Verde Unit 3 was in Mode 1 (Power Operation) at 100 percent power at normal operating temperature and normal operating pressure. There were no inoperable structures, systems, or components at the time that contributed to this event.

**4. EVENT DESCRIPTION:**

On January 19, 2011, at 1840, Unit 3 experienced a reactor power cutback (RPCB) (EIS Code: JD) from 100 percent power to approximately 60 percent power due to MFWP B tripping on low suction pressure. The low suction pressure was experienced by both MFWPs. The MFWP trip logic is designed to trip MFWP B first to prevent simultaneous MFWP trips. The low suction pressure was caused by a failed diaphragm in a pneumatic 3-way precision relay (precision relay) for the mini-flow valve on MFWP A (see diagram) which caused the mini-flow valve to fail open and divert a percentage of feedwater flow from both SGs to the condenser. The precision relay functions to cause full opening of the mini-flow valve when input control air pressure falls below 3 psig. Control air pressure is normally maintained between 3 to 15 psig. The failed diaphragm caused air leakage within the precision relay which lowered the input control air pressure to less than 3 psig and actuated the precision relay to open the mini-flow valve.

During this transient, both SG levels decreased to the point that a reactor trip (EIS Code: JC) occurred at 1841. The SG levels continued to lower following the reactor trip resulting in an AFAS (EIS Code: JE). Both auxiliary feedwater pumps A and B started and fed SGs in conjunction with MFWP A. The plant was stabilized in Mode 3.

**5. ASSESSMENT OF SAFETY CONSEQUENCES:**

There were no inoperable structures, systems, or components at the time that contributed to this event. The plant responded as designed for the RPCB, reactor trip and AFAS actuations. The conditional core damage probability for this event was calculated to be

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**NARRATIVE**

1.26E-6. This event did not result in any challenges to the fission product barriers or result in the release of radioactive materials. There were no actual safety consequences as a result of this event.

This event did not prevent the fulfillment of a safety function nor did it result in a safety system functional failure as described by 10 CFR 50.73 (a)(2)(v).

**6. CAUSE OF THE EVENT:**

The cause of the event was a failed diaphragm in the precision relay for the mini-flow valve control loop which resulted in the opening of the mini-flow valve on MFWP A. This allowed a percentage of feedwater flow to be diverted to the condenser, resulting in a MFWP B trip and a RPCB followed by a reactor trip and AFAS.

**7. CORRECTIVE ACTIONS:**

The following corrective actions were implemented:

1. The Unit 3 MFWP A mini-flow valve control system precision relay was immediately replaced.
2. The Unit 3 MFWP B mini-flow valve control system precision relay was replaced on February 18, 2011 as an interim action.

The extent of condition evaluation determined that the subject relays are not installed in the Units 1 and 2 MFWP mini-flow valve control systems. To improve maintenance reliability, a modification replaced these mini-flow valves and control systems during previous outages in Units 1 and 2. The same modification to replace the Unit 3 MFWP mini-flow valves and their control systems is planned during the next refueling outage.

The preventive maintenance process for these relays will be addressed as part of the corrective actions of this investigation. Any additional corrective actions taken as a result of the investigation of this event will be implemented in accordance with the requirements of the Palo Verde corrective action program. If information is subsequently developed which would significantly affect a reader's understanding or perception of this event, a supplement to this LER will be submitted.

**8. PREVIOUS SIMILAR EVENTS:**

No similar conditions have been reported by Palo Verde in the past three years.